PACIFICORP ENERGY
A DIVISION OF PACIFICORP

January 28, 2013

Mr. Steven A. Dietrich, Administrator
Wyoming Department of Environmental Quality, Air Quality Division
Herschler Building
122 West 25th Street
Cheyenne, WY 82002

Subject: PSD Applicability Determination for the Conversion of Naughton Unit 3 from Coal to Natural Gas Firing

Dear Mr. Dietrich:

PacifiCorp hereby submits this application to permit the conversion of Naughton Unit 3 from coal firing to natural gas firing. Following the conversion to natural gas, Naughton Unit 3 will be operated as a "slow start" peaking unit with a maximum annual average capacity factor of 40%.

The proposed conversion of Unit 3 to natural gas firing will require an upgrade of the existing natural gas supply system to provide sufficient fuel to achieve design boiler heat input; the installation of new low-NO_X gas burners; installation of a boiler flue gas recirculation system for thermodynamic and NO_X control; depowering and suspending operation of the electrostatic precipitator and coal feed and pulverizing systems; isolation of the existing sulfur dioxide scrubber from the combustion process; suspending operation of the bottom ash and fly ash handling systems; and modification of the boiler control system and ancillary equipment as necessary.

This application demonstrates that the proposed conversion of the Naughton Unit 3 boiler from coal to natural gas firing will not cause a significant emission increase of any affected criteria pollutant, including greenhouse gases.

NSPS/PSD Evaluation

The Table 1 identifies the results of the baseline and future potential criteria pollutant emissions evaluation associated with the conversion of Naughton Unit 3 from coal firing to natural gas firing. As indicated by the table and the discussion below, there are no significant criteria pollutant emissions increases following the fuel conversion. The detailed emissions calculations are provided in Attachment A.

Table 1 - Naughton Unit 3 Natural Gas Conversion Emissions Evaluation Summary

Pollutant	Baseline Emissions (tons/year)	Future Potential Emissions (tons/year)	Emissions Increase or Decrease (tons/year)	PSD Significance Level (tons/year)	Is PSD Permitting Triggered?
NO_X	5,945.9	648.2	-5,297.7	40	No
SO_2	5,195.5	3.8	-5,191.7	40	No
CO	875.8	972.4	96.6	100	No
PM_{10}	1,446.4	51.9	-1,394.6	15	No
$PM_{2.5}$	626.1	51.9	-574.2	10	No
CO_2e	2,826,967.8	764,203.1	-2,062,764.6	75,000	No
VOC	40.1	35.0	-5.1	40	No
Lead (Pb)	0.2	0.0	-0.2	0.6	No

NO_X Emissions

Annual NO_X emissions will decrease due to the post-project maximum annual average capacity factor of 40% and from the installation of new low-NO_X gas burners and a flue gas recirculation system for NO_X control.

PacifiCorp will continue to demonstrate compliance with established NO_X emission limits through the use of certified continuous emissions monitors.

SO_2 Emissions

SO_2 emissions will decrease following the conversion to natural gas firing due to the reduced sulfur concentration of natural gas as compared to the existing subbituminous coal fuel supply as well as the post-project 40% maximum annual average capacity factor.

PacifiCorp will calculate hourly emissions in accordance with 40 CFR Part 75 Appendix D to demonstrate compliance with established SO_2 emission limits. Hourly emissions will be calculated utilizing an emission factor of 0.0006 lb/MMBtu for pipeline quality natural gas.

CO Emissions

Carbon monoxide emissions result from the combustion of carbon-containing fuel in the Unit 3 boiler. There will not be a significant increase in CO emissions following the conversion of Unit 3 to natural gas firing. The future potential annual CO emissions have been calculated using a guaranteed emission factor provided by the low-NO_X burner manufacturer and an annual boiler operating capacity factor of 40%.

PM_{10} and $PM_{2.5}$ Emissions

PM_{10} and $PM_{2.5}$ emissions result from the combustion of fuel in the Unit 3 boiler. Burning natural gas results in lower annual particulate matter emission rates. This results in a reduction in annual PM_{10} and $PM_{2.5}$ emissions following the conversion of Unit 3 to natural gas firing.

Greenhouse Gas (CO_2e) Emissions

Greenhouse gas emissions, as carbon dioxide equivalent (CO_2e), result primarily from carbon dioxide (CO_2) which is created by fuel-bound carbon that is oxidized in the boiler combustion process, and to a lesser extent from other combustion gases including methane (CH_4) and nitrous oxide (N_2O). Greenhouse gas emissions will decrease following the conversion of Unit 3 to natural gas firing primarily due to the reduced fuel-bound carbon contained in natural gas as compared to the existing subbituminous coal fuel supply.

VOC Emissions

VOC emissions result from the combustion of fuel in the Unit 3 boiler, with some of the fuel-bound organic matter oxidizing to volatile organic compounds. The proposed project will provide a net decrease in the annual VOC emissions following the conversion of Unit 3 to natural gas firing.

Comparison of the BART-Controlled Unit to the Unit Converted to Natural Gas

In its proposed Regional Haze State Implementation Plan (SIP) the Wyoming Department of Environmental Quality made a determination that Naughton Unit 3 would be required to install selective catalytic reduction to reduce NOx emissions to 0.07 lb/MMBtu and a baghouse that would achieve a particulate matter emission rate of 0.015 lb/MMBtu. There was also the expectation that the unit would achieve a sulfur dioxide emission rate of 0.22 lb/MMBtu. The state modeled these conditions to determine the visibility impacts and improvements associated with installing the identified BART controls.

PacifiCorp has made a comparison of the NO_X, SO_2 and PM emissions and visibility impacts associated with the proposed BART controls to those associated with the gas conversion. Table 2 provides a comparison of the hourly and annual emissions associated with the two alternatives.

Table 2 - Changes in Annual SO_2, NO_X and PM Emissions if Naughton 3 is Converted to Natural Gas Rather than Install BART Controls

Parameter	Coal (BART Limits)	Gas Firing	Difference
Unit Hourly Heat Input, MMBtu/hr	3,700	3,700	0
Annual Capacity Factor	90%	40%	(50%)
Unit Annual Heat Input, MMBtu/yr	29,170,800	12,964,800	(16,206,000)
Controlled SO_2 Rate, lb/MMBtu	0.2200	0.0006	(0.2194)
Hourly SO_2 Emissions, lb/hour	814	2	(812)
Annual SO_2, tons/year	3,209	4	(3,205)
Controlled NOx Rate, lb/MMBtu	0.07	0.10	0.03
Hourly NO_X Emissions, lb/hour	259	370	111
Annual NO_X, tons/year	1,021	648	(373)
Controlled PM Rate, lb/MMBtu	0.015	0.008	(0.007)
Hourly PM Emissions, lb/hour	56	30	(26)
Annual PM, tons/year	219	52	(167)
SUMMARY - Reductions Beyond BART Determined Emissions			
Reduction in Annual SO_2 Emissions, tons/year			3,205
Reduction in Annual NO_X Emissions, tons/year			373
Reduction in Annual PM Emissions, tons/year			167

The following table compares the modeled visibility impacts associated with Naughton 3 being fired on coal with BART controls to the modeled impacts associated with converting the unit to natural gas. Although PacifiCorp continues to question the accuracy of the models that have been used, we believe the relative results can be used to determine if the gas conversion will have a positive modeled impact on visibility. As identified in Table 3, the modeled results indicate the gas conversion will result in better visibility and fewer days of impact than the BART proposal.

Table 3 - Bridger Wilderness				
98th Percentile Impact (dV)				
Model	**2001**	**2002**	**2003**	**AVG**
State/EPA Proposed BART Controls	0.710	0.650	0.830	0.730
Gas Conversion	0.275	0.241	0.345	0.287

Table 3 - Bridger Wilderness				
Number of Days > 0.5 Delta dV				
Model	**2001**	**2002**	**2003**	**MAX**
State/EPA Proposed BART Controls	17	10	14	17
Gas Conversion	3	3	1	3

Additional details and modeling results are contained in Attachment B. (CH2M HILL Naughton Unit 3 Firing Natural Gas CALPUFF Modeling)

When compared to the unit operating on coal with BART controls in service, the conversion of Naughton Unit 3 to natural gas results in a reduction in annual NO_X, SO_2 and PM emissions, as well as a modeled improvement in the visibility impacts of the unit. The conversion of Naughton 3 to natural gas results in a better-than-BART alternative.

Timing

Permit MD-6042A2 which was issued March 7, 2012, requires PacifiCorp to install the selective catalytic reduction and baghouse by December 31, 2014. Due to significant costs that can be mitigated by delaying this conversion, PacifiCorp requests that the conversion be delayed up to five years following the EPA's approval of the state's 309(g) regional haze SIP. If this delay is allowed, PacifiCorp will need to meet the Mercury and Air Toxics Standard (MATS). PacifiCorp is currently evaluating how this rule will impact the unit. Within the next two weeks PacifiCorp will provide the WAQD with additional details on how the unit will operate and the unit's emissions profile following the MATS compliance date. This additional information will be useful as the state considers PacifiCorp's timing request.

Please contact me at (801) 220-4581 or Jim Doak at (801) 220-2306 if you have any questions or comments regarding this request seeking authorization to convert Naughton Unit 3 from coal to natural gas firing.

Sincerely,

William K. Lawson

William K. Lawson
Director, Environmental Services

Attachments:
Appendix A: Naughton Unit 3 Conversion to Natural Gas Firing Emissions Evaluation
Appendix B: CH2M HILL Natural Gas Conversion Modeling Report

c: Cole Anderson – NSR Air Quality Engineer, Wyoming Air Quality Division
Jim Doak
Richard Goff
Craig Lucke
Jason Murdock
Dana Ralston
Steve Richards
Shawn Smith
Chad Teply
Scott Wetzel
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Appendix A

Naughton Unit 3
Conversion to Natural Gas Firing
Emissions Evaluation

Naughton Unit 3: 5-Year Emissions Evaluation
Past Actual Criteria Pollutant Emission Rates
Five-Year Evaluation Period: October 2007 - September 2012
Nitrogen Oxides (NO_X) Emissions

Month	Unit 3 NO_X Emissions (tons/month)	Annual NO_X Emissions 24-Month Averaging Basis (tons/year)
October-07	431.8	
November-07	403.2	
December-07	485.5	
January-08	583.7	
February-08	439.0	
March-08	565.436	
April-08	245.8	
May-08	556.4	
June-08	448.7	
July-08	455.9	
August-08	548.8	
September-08	480.1	
October-08	545.6	
November-08	482.4	
December-08	573.3	
January-09	547.5	
February-09	531.3	
March-09	294.0	
April-09	0.0	
May-09	92.5	
June-09	440.5	
July-09	581.1	
August-09	553.4	
September-09	562.7	5,424.4
October-09	543.8	5,480.4
November-09	522.6	5,540.0
December-09	422.1	5,508.3
January-10	529.5	5,481.2
February-10	492.7	5,508.1
March-10	525.6	5,488.1
April-10	505.7	5,618.1
May-10	462.1	5,570.9
June-10	533.7	5,613.4
July-10	582.4	5,676.7
August-10	590.5	5,697.5
September-10	509.7	5,712.3
October-10	458.1	5,668.6
November-10	498.0	5,676.4
December-10	509.3	5,644.4
January-11	452.8	5,597.0
February-11	421.0	5,541.9
March-11	473.7	5,631.8
April-11	414.7	5,839.1
May-11	264.1	5,924.9
June-11	482.5	5,945.9
July-11	541.1	5,925.9
August-11	532.7	5,915.6
September-11	512.1	5,890.3
October-11	512.3	5,874.5
November-11	516.3	5,871.4
December-11	504.8	5,912.7
January-12	512.8	5,904.4
February-12	442.7	5,879.4
March-12	493.1	5,863.2
April-12	444.0	5,832.3
May-12	425.4	5,813.9
June-12	338.5	5,716.3
July-12	292.0	5,571.1
August-12	351.6	5,451.7
September-12	361.7	5,377.7

Naughton Unit 3: 5-Year Emissions Evaluation
Past Actual Criteria Pollutant Emission Rates
Five-Year Evaluation Period: October 2007 - September 2012
Sulfur Dioxide (SO_2) Emissions

Month	Unit 3 SO_2 Emissions (tons/month)	Annual SO_2 Emissions 24-Month Averaging Basis (tons/year)
October-07	452.5	
November-07	372.2	
December-07	459.1	
January-08	548.4	
February-08	424.2	
March-08	549.652	
April-08	211.4	
May-08	503.1	
June-08	526.0	
July-08	427.8	
August-08	514.6	
September-08	448.1	
October-08	500.1	
November-08	446.2	
December-08	565.6	
January-09	504.4	
February-09	488.6	
March-09	292.6	
April-09	0.0	
May-09	90.4	
June-09	422.9	
July-09	562.0	
August-09	539.3	
September-09	428.8	5,139.1
October-09	503.0	5,164.3
November-09	434.7	5,195.5
December-09	399.1	5,165.5
January-10	535.6	5,159.1
February-10	482.8	5,188.4
March-10	403.8	5,115.5
April-10	355.1	5,187.3
May-10	217.0	5,044.3
June-10	216.9	4,889.7
July-10	479.3	4,915.4
August-10	467.1	4,891.7
September-10	360.1	4,847.7
October-10	353.6	4,774.4
November-10	388.5	4,745.5
December-10	427.6	4,676.5
January-11	401.3	4,625.0
February-11	369.1	4,565.2
March-11	414.9	4,626.4
April-11	364.5	4,808.6
May-11	214.4	4,870.7
June-11	403.9	4,861.2
July-11	442.3	4,801.3
August-11	418.6	4,740.9
September-11	333.7	4,693.4
October-11	417.7	4,650.8
November-11	454.9	4,660.9
December-11	433.8	4,678.3
January-12	429.7	4,625.3
February-12	361.0	4,564.4
March-12	382.7	4,553.8
April-12	318.5	4,535.5
May-12	389.6	4,621.8
June-12	382.0	4,704.4
July-12	342.2	4,635.9
August-12	416.1	4,610.4
September-12	460.2	4,660.4

Naughton Unit 3: 5-Year Emissions Evaluation
Past Actual Criteria Pollutant Emission Rates
Five-Year Evaluation Period: January 2011 - December 2012
Carbon Monoxide (CO) Emissions

Month	Unit 3 CO Emissions (tons/month)	Annual CO Emissions 24-Month Averaging Basis tons/year
January-11	72.4	
February-11	167.3	
March-11	232.0	
April-11	329.5	
May-11	32.0	
June-11	22.914	
July-11	51.3	
August-11	72.6	
September-11	102.2	
October-11	112.1	
November-11	69.7	
December-11	75.1	
January-12	20.9	
February-12	22.2	
March-12	26.6	
April-12	51.5	
May-12	39.5	
June-12	44.0	
July-12	62.1	
August-12	21.8	
September-12	39.2	
October-12	30.3	
November-12	21.2	
December-12	33.2	875.8

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Naughton Unit 3: 5-Year Emissions Evaluation
Past Actual Criteria Pollutant Emission Rates
Five-Year Evaluation Period: October 2007 - September 2012
Particulate Matter (PM_{10} and $PM_{2.5}$) Emissions

Month	Unit 3 Heat Input (MMBtu/month)	Unit 3 PM_{10} Emission Rate (lb/MMBtu)	Unit 3 PM_{10} Emissions (tons/month)	Annual PM_{10} Emissions 24-Month Averaging Basis (tons/year)	Unit 3 $PM_{2.5}$ (tons/month)[a]	Annual $PM_{2.5}$ Emissions 24-Month Averaging Basis (tons/year)
October-07	2,443,352.6	0.033	40.3		17.4	
November-07	2,172,910.8	0.033	35.9		15.5	
December-07	2,424,089.7	0.033	40.0		17.3	
January-08	2,819,780.3	0.033	46.5		20.1	
February-08	2208359.8	0.033	36.4		15.8	
March-08	2775376.722	0.033	45.8		19.8	
April-08	1,154,627.3	0.033	19.1		8.2	
May-08	2,554,442.0	0.033	42.1		18.2	
June-08	2,415,242.6	0.051	61.6		26.7	
July-08	2,069,402.2	0.051	52.8		22.8	
August-08	2,464,554.1	0.051	62.8		27.2	
September-08	2,148,510.9	0.051	54.8		23.7	
October-08	2,416,748.8	0.051	61.6		26.7	
November-08	2,153,395.1	0.051	54.9		23.8	
December-08	2,557,396.8	0.051	65.2		28.2	
January-09	2,384,966.7	0.051	60.8		26.3	
February-09	2,341,126.5	0.051	59.7		25.8	
March-09	1,360,610.5	0.051	34.7		15.0	
April-09	0.0	0.051	0.0		0.0	
May-09	439,539.3	0.051	11.2		4.9	
June-09	2,097,681.4	0.051	53.5		23.2	
July-09	2,754,772.2	0.051	70.2		30.4	
August-09	2,648,996.2	0.051	67.5		29.2	
September-09	2,663,178.8	0.051	67.9	572.7	29.4	247.9
October-09	2,553,604.0	0.051	65.1	585.1	28.2	253.3
November-09	2,336,975.2	0.051	59.6	597.0	25.8	258.4
December-09	2,117,527.3	0.1471	155.7	654.9	67.4	283.5
January-10	2,476,576.8	0.1471	182.2	722.7	78.8	312.8
February-10	2,232,741.4	0.1471	164.2	786.6	71.1	340.5
March-10	2,376,957.1	0.1471	174.8	851.1	75.7	368.4
April-10	2,296,947.1	0.1471	168.9	926.0	73.1	400.8
May-10	2,091,137.0	0.1471	153.8	981.9	66.6	425.0
June-10	2,267,796.9	0.1471	166.8	1,034.5	72.2	447.8
July-10	2,524,495.9	0.1471	185.7	1,100.9	80.4	476.5
August-10	2,523,245.9	0.1471	185.6	1,162.3	80.3	503.1
September-10	2,205,555.5	0.1471	162.2	1,216.0	70.2	526.3
October-10	2,001,763.5	0.0983	98.4	1,234.4	42.6	534.3
November-10	2,175,671.4	0.0983	106.9	1,260.4	46.3	545.6
December-10	2,181,487.3	0.0983	107.2	1,281.4	46.4	554.6
January-11	2,023,425.9	0.0983	99.5	1,300.7	43.0	563.0
February-11	1,902,230.9	0.0983	93.5	1,317.6	40.5	570.3
March-11	2,132,507.0	0.0983	104.8	1,352.7	45.4	585.5
April-11	1,849,959.1	0.0983	90.9	1,398.2	39.4	605.2
May-11	1,146,316.0	0.0983	56.3	1,420.7	24.4	614.9
June-11	2,134,917.5	0.0983	104.9	1,446.4	45.4	626.1
July-11	2,447,966.1	0.0371	45.4	1,434.0	19.7	620.7
August-11	2,430,042.8	0.0371	45.1	1,422.8	19.5	615.8
September-11	2,360,182.7	0.0371	43.8	1,410.7	19.0	610.6
October-11	2,361,015.4	0.0371	43.8	1,400.1	19.0	606.0
November-11	2,354,935.1	0.0371	43.7	1,392.1	18.9	602.6
December-11	2,360,769.3	0.0371	43.8	1,336.1	19.0	578.3
January-12	2,365,364.4	0.0371	43.9	1,267.0	19.0	548.4
February-12	2,035,832.6	0.0371	37.8	1,203.8	16.3	521.0
March-12	2,264,846.8	0.0371	42.0	1,137.4	18.2	492.3
April-12	2,037,492.8	0.16	163.0	1,134.4	70.6	491.0
May-12	2,356,047.1	0.16	188.5	1,151.7	81.6	498.5
June-12	2,275,608.4	0.16	182.0	1,159.4	78.8	501.8
July-12	2,001,814.0	0.16	160.1	1,146.6	69.3	496.3
August-12	2,234,407.1	0.16	178.8	1,143.2	77.4	494.8
September-12	2,414,964.2	0.16	193.2	1,158.7	83.6	501.5

[a] $PM_{2.5}$ emissions are equivalent to 29% of PM and PM_{10} is equivalent to 67% of PM for an ESP-controlled boiler (AP-42, Table 1.1-6)

Naughton Unit 3: 5-Year Emissions Evaluation
Past Actual Criteria Pollutant Emission Rates
Five-Year Evaluation Period: October 2007 - September 2012
Greenhouse Gas (CO_2e) Emissions

Month	Unit 3 CO_2 Emissions (tons/month)	Coal Burned (tons/month)	CH_4 Emissions (tons CO_2e/month)	N_2O Emissions (tons CO_2e/month)	CO_2e Emissions (tons/month)	Annual Greenhouse Gas Emissions 24-Month Averaging Basis (tons CO_2e/year)
October-07	250,089.2	115,474.9	48.5	1,431.9	251,569.6	
November-07	221,665.0	101,236.0	42.5	1,255.3	222,962.8	
December-07	248,180.2	113,591.0	47.7	1,408.5	249,636.4	
January-08	289,106.3	121,803.0	51.2	1,510.4	290,667.8	
February-08	225381.0	95,926.0	40.3	1,189.5	226,610.7	
March-08	284465.514	122,717.7	51.5	1,521.7	286,038.8	
April-08	117,213.2	50,666.8	21.3	628.3	117,862.8	
May-08	261,626.5	114,985.6	48.3	1,425.8	263,100.6	
June-08	247,245.7	106,770.7	44.8	1,324.0	248,614.5	
July-08	210,431.6	92,740.5	39.0	1,150.0	211,620.5	
August-08	256,821.6	115,239.0	48.4	1,429.0	258,299.0	
September-08	224,799.7	102,948.0	43.2	1,276.6	226,119.5	
October-08	252,971.2	116,820.0	49.1	1,448.6	254,468.8	
November-08	224,699.0	100,176.0	42.1	1,242.2	225,983.3	
December-08	267,940.2	119,569.4	50.2	1,482.7	269,473.1	
January-09	249,831.7	111,952.0	47.0	1,388.2	251,266.9	
February-09	245,468.1	109,303.0	45.9	1,355.4	246,869.4	
March-09	142,699.9	62,815.0	26.4	778.9	143,505.2	
April-09	0.0	0.0	0.0	0.0	0.0	
May-09	46,098.9	19,886.0	8.4	246.6	46,353.9	
June-09	220,005.9	97,042.0	40.8	1,203.3	221,250.0	
July-09	288,908.9	128,104.0	53.8	1,588.5	290,551.2	
August-09	277,826.2	125,609.0	52.8	1,557.6	279,436.5	
September-09	279,315.1	124,977.0	52.5	1,549.7	280,917.3	2,681,589.2
October-09	267,821.1	119,223.5	50.1	1,478.4	269,349.6	2,690,479.3
November-09	245,102.4	114,346.0	48.0	1,417.9	246,568.3	2,702,282.0
December-09	222,087.4	101,709.0	42.7	1,261.2	223,391.4	2,689,159.5
January-10	259,460.1	119,886.0	50.4	1,486.6	260,997.1	2,674,324.1
February-10	233,393.8	105,814.0	44.4	1,312.1	234,750.3	2,678,393.9
March-10	249,135.6	113,376.0	47.6	1,405.9	250,589.1	2,660,669.1
April-10	240,855.2	127,074.0	53.4	1,575.7	242,484.3	2,722,979.8
May-10	219,086.9	114,928.0	48.3	1,425.1	220,560.3	2,701,709.6
June-10	237,786.9	115,926.0	48.7	1,437.5	239,273.1	2,697,038.9
July-10	264,681.2	127,015.0	53.3	1,575.0	266,309.5	2,724,383.4
August-10	264,512.3	127,540.1	53.6	1,581.5	266,147.4	2,728,307.6
September-10	231,147.9	109,996.0	46.2	1,364.0	232,558.1	2,731,526.9
October-10	209,628.6	103,775.0	43.6	1,286.8	210,959.0	2,709,772.0
November-10	227,807.5	112,968.0	47.4	1,400.8	229,255.8	2,711,408.3
December-10	228,655.2	112,761.0	47.4	1,398.2	230,100.8	2,691,722.1
January-11	212,074.6	83,382.6	35.0	1,033.9	213,143.6	2,672,660.4
February-11	199,496.8	102,448.6	43.0	1,270.4	200,810.2	2,649,630.9
March-11	223,558.9	107,464.7	45.1	1,332.6	224,936.6	2,690,346.5
April-11	193,701.4	97,683.5	41.0	1,211.3	194,953.7	2,787,823.4
May-11	119,879.4	64,338.3	27.0	797.8	120,704.3	2,824,998.6
June-11	223,767.4	110,844.0	46.6	1,374.5	225,188.4	2,826,967.8
July-11	256,683.6	120,793.2	50.7	1,497.8	258,232.2	2,810,808.3
August-11	254,750.0	119,859.0	50.3	1,486.3	256,286.6	2,799,233.3
September-11	247,462.6	118,221.3	49.7	1,465.9	248,978.2	2,783,263.8
October-11	247,574.6	112,497.5	47.2	1,395.0	249,016.8	2,773,097.4
November-11	246,902.8	119,261.6	50.1	1,478.8	248,431.7	2,774,029.1
December-11	247,519.1	118,749.6	49.9	1,472.5	249,041.5	2,786,854.2
January-12	247,913.7	115,943.6	48.7	1,437.7	249,400.1	2,781,055.7
February-12	213,152.5	100,844.2	42.4	1,250.5	214,445.3	2,770,903.2
March-12	237,428.8	115,238.2	48.4	1,429.0	238,906.1	2,765,061.7
April-12	213,600.6	103,886.3	43.6	1,288.2	214,932.4	2,751,285.7
May-12	247,022.8	120,657.4	50.7	1,496.2	248,569.6	2,765,290.4
June-12	238,665.8	121,128.3	50.9	1,502.0	240,218.7	2,765,763.2
July-12	209,712.7	106,371.0	44.7	1,319.0	211,076.4	2,738,146.6
August-12	234,242.8	119,718.8	50.3	1,484.5	235,777.6	2,722,961.7
September-12	253,281.9	128,081.0	53.8	1,588.2	254,923.9	2,734,144.6

Note: CH_4 greenhouse gas emissions based on AP-42 emission factor of 0.04 lb/ton and global warming potential factor of 21.
N_2O greenhouse gas emissions based on AP-42 emission factor of 0.08 lb/ton and global warming potential factor of 310.

Naughton Unit 3: 5-Year Emissions Evaluation
Past Actual Criteria Pollutant Emission Rates
Five-Year Evaluation Period: October 2007 - September 2012
Volatile Organic Compound (VOC) Emissions

Month	Coal Burned (tons/month)	AP-42 VOC Emission Factor (lb VOC/ton coal) (as total non-methane organic compounds)	VOC Emissions (tons/month)	Annual VOC Emissions 24-Month Averaging Basis (tons/year)
October-07	115,474.9	0.06	3.5	
November-07	101,236.0	0.06	3.0	
December-07	113,591.0	0.06	3.4	
January-08	121,803.0	0.06	3.7	
February-08	95926.0	0.06	2.9	
March-08	122717.727	0.06	3.7	
April-08	50,666.8	0.06	1.5	
May-08	114,985.6	0.06	3.4	
June-08	106,770.7	0.06	3.2	
July-08	92,740.5	0.06	2.8	
August-08	115,239.0	0.06	3.5	
September-08	102,948.0	0.06	3.1	
October-08	116,820.0	0.06	3.5	
November-08	100,176.0	0.06	3.0	
December-08	119,569.4	0.06	3.6	
January-09	111,952.0	0.06	3.4	
February-09	109,303.0	0.06	3.3	
March-09	62,815.0	0.06	1.9	
April-09	0.0	0.06	0.0	
May-09	19,886.0	0.06	0.6	
June-09	97,042.0	0.06	2.9	
July-09	128,104.0	0.06	3.8	
August-09	125,609.0	0.06	3.8	
September-09	124,977.0	0.06	3.7	35.6
October-09	119,223.5	0.06	3.6	35.6
November-09	114,346.0	0.06	3.4	35.8
December-09	101,709.0	0.06	3.1	35.6
January-10	119,886.0	0.06	3.6	35.6
February-10	105,814.0	0.06	3.2	35.7
March-10	113,376.0	0.06	3.4	35.6
April-10	127,074.0	0.06	3.8	36.8
May-10	114,928.0	0.06	3.4	36.8
June-10	115,926.0	0.06	3.5	36.9
July-10	127,015.0	0.06	3.8	37.4
August-10	127,540.1	0.06	3.8	37.6
September-10	109,996.0	0.06	3.3	37.7
October-10	103,775.0	0.06	3.1	37.5
November-10	112,968.0	0.06	3.4	37.7
December-10	112,761.0	0.06	3.4	37.6
January-11	83,382.6	0.06	2.5	37.2
February-11	102,448.6	0.06	3.1	37.1
March-11	107,464.7	0.06	3.2	37.7
April-11	97,683.5	0.06	2.9	39.2
May-11	64,338.3	0.06	1.9	39.9
June-11	110,844.0	0.06	3.3	40.1
July-11	120,793.2	0.06	3.6	40.0
August-11	119,859.0	0.06	3.6	39.9
September-11	118,221.3	0.06	3.5	39.8
October-11	112,497.5	0.06	3.4	39.7
November-11	119,261.6	0.06	3.6	39.7
December-11	118,749.6	0.06	3.6	40.0
January-12	115,943.6	0.06	3.5	39.9
February-12	100,844.2	0.06	3.0	39.9
March-12	115,238.2	0.06	3.5	39.9
April-12	103,886.3	0.06	3.1	39.5
May-12	120,657.4	0.06	3.6	39.6
June-12	121,128.3	0.06	3.6	39.7
July-12	106,371.0	0.06	3.2	39.4
August-12	119,718.8	0.06	3.6	39.3
September-12	128,081.0	0.06	3.8	39.6

Naughton Unit 3: 5-Year Emissions Evaluation
Past Actual Criteria Pollutant Emission Rates
Five-Year Evaluation Period: October 2007 - September 2012
Lead (Pb) Emissions

Month	Unit 3 Heat Input (MMBtu/month)	Coal Burned (tons/month)	Coal Lead Concentration (C) (ppm)	Coal Ash Fraction (A)	Unit 3 PM_{10} Emission Rate (lb/MMBtu)	Unit 3 PM Emission Rate [a] (PM) (lb/MMBtu)	Unit 3 Lead Emission Rate [b] (lb/10^{12} Btu)	Unit 3 Lead Emissions (lb/month)	Unit 3 Lead Emissions (tons/month)	Annual Lead Emissions 24-Month Averaging Basis (tons/year)
October-07	2,443,352.6	115,474.9	2.1	0.056	0.033	0.049	5.53	13.5	0.0068	
November-07	2,172,910.8	101,236.0	2.1	0.061	0.033	0.049	5.14	11.2	0.0056	
December-07	2,424,089.7	113,591.0	2.1	0.064	0.033	0.049	5.01	12.1	0.0061	
January-08	2,819,780.3	121,803.0	2.0	0.063	0.033	0.049	4.89	13.8	0.0069	
February-08	2208359.8	95,926.0	2.0	0.066	0.033	0.049	4.67	10.3	0.0052	
March-08	2775376.722	122,717.7	2.0	0.058	0.033	0.049	5.18	14.4	0.0072	
April-08	1,154,627.3	50,666.8	2.0	0.060	0.033	0.049	5.04	5.8	0.0029	
May-08	2,554,442.0	114,985.6	2.0	0.060	0.033	0.049	5.03	12.8	0.0064	
June-08	2,415,242.6	106,770.7	2.0	0.056	0.051	0.076	7.54	18.2	0.0091	
July-08	2,069,402.2	92,740.5	2.0	0.059	0.051	0.076	7.31	15.1	0.0076	
August-08	2,464,554.1	115,239.0	2.0	0.053	0.051	0.076	7.92	19.5	0.0098	
September-08	2,148,510.9	102,948.0	2.0	0.060	0.051	0.076	7.21	15.5	0.0077	
October-08	2,416,748.8	116,820.0	2.0	0.059	0.051	0.076	7.25	17.5	0.0088	
November-08	2,153,395.1	100,176.0	2.0	0.057	0.051	0.076	7.47	16.1	0.0080	
December-08	2,557,396.8	119,569.4	2.0	0.057	0.051	0.076	7.44	19.0	0.0095	
January-09	2,384,966.7	111,952.0	2.0	0.062	0.051	0.076	6.98	16.6	0.0083	
February-09	2,341,126.5	109,303.0	2.0	0.071	0.051	0.076	6.27	14.7	0.0073	
March-09	1,360,610.5	62,815.0	2.0	0.055	0.051	0.076	7.70	10.5	0.0052	
April-09	0.0	0.0	2.0	0.000	0.051	0.076	0.00	0.0	0.0000	
May-09	439,539.3	19,886.0	2.0	0.064	0.051	0.076	6.78	3.0	0.0015	
June-09	2,097,681.4	97,042.0	2.0	0.055	0.051	0.076	7.63	16.0	0.0080	
July-09	2,754,772.2	128,104.0	2.0	0.053	0.051	0.076	7.93	21.9	0.0109	
August-09	2,648,996.2	125,609.0	2.0	0.057	0.051	0.076	7.48	19.8	0.0099	
September-09	2,663,178.8	124,977.0	2.0	0.059	0.051	0.076	7.27	19.4	0.0097	0.08
October-09	2,553,604.0	119,223.5	2.0	0.064	0.051	0.076	6.78	17.3	0.0087	0.09
November-09	2,336,975.2	114,346.0	2.0	0.071	0.051	0.076	6.23	14.6	0.0073	0.09
December-09	2,117,527.3	101,709.0	2.0	0.072	0.1471	0.220	14.43	30.6	0.0153	0.09
January-10	2,476,576.8	119,886.0	2.2	0.081	0.1471	0.220	14.46	35.8	0.0179	0.10
February-10	2,232,741.4	105,814.0	2.2	0.061	0.1471	0.220	18.16	40.5	0.0203	0.10
March-10	2,376,957.1	113,376.0	2.2	0.071	0.1471	0.220	16.06	38.2	0.0191	0.11
April-10	2,296,947.1	127,074.0	2.2	0.071	0.1471	0.220	15.95	36.6	0.0183	0.12
May-10	2,091,137.0	114,928.0	2.2	0.069	0.1471	0.220	16.47	34.4	0.0172	0.12
June-10	2,267,796.9	115,926.0	2.2	0.068	0.1471	0.220	16.66	37.8	0.0189	0.13
July-10	2,524,495.9	127,015.0	2.2	0.068	0.1471	0.220	16.56	41.8	0.0209	0.13
August-10	2,523,245.9	127,540.1	2.2	0.065	0.1471	0.220	17.11	43.2	0.0216	0.14
September-10	2,205,555.5	109,996.0	2.2	0.071	0.1471	0.220	16.04	35.4	0.0177	0.15
October-10	2,001,763.5	103,775.0	2.2	0.060	0.0983	0.147	13.37	26.8	0.0134	0.15
November-10	2,175,671.4	112,968.0	2.2	0.062	0.0983	0.147	13.02	28.3	0.0142	0.15
December-10	2,181,487.3	112,761.0	2.2	0.056	0.0983	0.147	14.09	30.7	0.0154	0.15
January-11	2,023,425.9	83,382.6	2.0	0.064	0.0983	0.147	11.55	23.4	0.0117	0.16
February-11	1,902,230.9	102,448.6	2.0	0.062	0.0983	0.147	11.73	22.3	0.0112	0.16
March-11	2,132,507.0	107,464.7	2.0	0.056	0.0983	0.147	12.72	27.1	0.0136	0.16
April-11	1,849,959.1	97,683.5	2.0	0.061	0.0983	0.147	11.91	22.0	0.0110	0.17
May-11	1,146,316.0	64,338.3	2.0	0.061	0.0983	0.147	11.93	13.7	0.0068	0.17
June-11	2,134,917.5	110,844.0	2.0	0.055	0.0983	0.147	13.03	27.8	0.0139	0.17
July-11	2,447,966.1	120,793.2	2.0	0.055	0.0371	0.055	5.95	14.6	0.0073	0.17
August-11	2,430,042.8	119,859.0	2.0	0.050	0.0371	0.055	6.42	15.6	0.0078	0.17
September-11	2,360,182.7	118,221.3	2.0	0.046	0.0371	0.055	6.91	16.3	0.0082	0.17
October-11	2,361,015.4	112,497.5	2.0	0.049	0.0371	0.055	6.51	15.4	0.0077	0.17
November-11	2,354,935.1	119,261.6	2.0	0.049	0.0371	0.055	6.54	15.4	0.0077	0.17
December-11	2,360,769.3	118,749.6	2.0	0.048	0.0371	0.055	6.61	15.6	0.0078	0.16
January-12	2,365,364.4	115,943.6	2.2	0.048	0.0371	0.055	7.34	17.4	0.0087	0.16
February-12	2,035,832.6	100,844.2	2.2	0.049	0.0371	0.055	7.14	14.5	0.0073	0.15
March-12	2,264,846.8	115,238.2	2.2	0.052	0.0371	0.055	6.80	15.4	0.0077	0.15
April-12	2,037,492.8	103,886.3	2.2	0.051	0.16	0.239	22.22	45.3	0.0226	0.15
May-12	2,356,047.1	120,657.4	2.2	0.048	0.16	0.239	23.51	55.4	0.0277	0.16
June-12	2,275,608.4	121,128.3	2.2	0.048	0.16	0.239	23.55	53.6	0.0268	0.16
July-12	2,001,814.0	106,371.0	2.2	0.053	0.16	0.239	21.78	43.6	0.0218	0.16
August-12	2,234,407.1	119,718.8	2.2	0.056	0.16	0.239	20.87	46.6	0.0233	0.16
September-12	2,414,964.2	128,081.0	2.2	0.058	0.16	0.239	20.17	48.7	0.0244	0.16

[a] Total PM is equivalent to $PM_{10}/0.67$ for an ESP-controlled boiler (AP-42 Table 1.1-6)

[b] Lead emissions are equivalent to $3.8*(C/A * PM)^{0.80}$ lb/10^{12} Btu (AP-42, Table 1.1-16)

Naughton Unit 3 Conversion to Natural Gas Firing
Future Potential Emissions

Parameter	Value		Reference	
Maximum Boiler Heat Inpu	3,700	MMBtu/hour	Boiler Design	
Boiler Capacity Factor:	40%		Post-Natural Gas Conversion Maximum Annual Average Capacity Factor	
Annual Operation:	3,504	hours/year	Based on 40% Capacity Factor	
NO_X Emission Rate:	0.10	lb/MMBtu	Proposed Emission Limit	
SO_2 Emission Rate:	0.0006	lb/MMBtu	AP-42, Table 1.4-2	[(0.6 lb/10^6 scf)/(1,020 Btu/scf)]
CO Emission Rate:	0.15	lb/MMBtu	Manufacturer Guarantee	
PM_{10} Emission Rate:	0.0	lb/MMBtu	AP-42, Table 1.4-2	[(7.6 lb/10^6 scf)/(1,020 Btu/scf)]
$PM_{2.5}$ Emission Rate:	0.008	lb/MMBtu	AP-42, Table 1.4-2	[(7.6 lb/10^6 scf)/(1,020 Btu/scf)]
CO_2 Emission Rate:	117.6	lb/MMBtu	AP-42, Table 1.4-2	[(120,000 lb/10^6 scf)/(1,020 Btu/scf)]
CH_4 Emission Rate:	0.0023	lb/MMBtu	AP-42, Table 1.4-2	[(2.3 lb/10^6 scf)/(1,020 Btu/scf)]
N_2O Emission Rate:	0.0006	lb/MMBtu	AP-42, Table 1.4-2	[(0.64 lb/10^6 scf)/(1,020 Btu/scf)]
CO_2e Emission Rate:	117.9	lb/MMBtu	CH_4 GWP Factor of 21 and N_2O GWP factor of 310	
VOC Emission Rate:	0.0054	lb/MMBtu	AP-42, Table 1.4-2	[(5.5 lb/10^6 scf)/(1,020 Btu/scf)]
Lead Emission Rate	0.00000049	lb/MMBtu	AP-42, Table 1.4-2	[(0.0005 lb/10^6 scf)/(1,020 Btu/scf)]

Pollutant	Future Potential Emissions	
	(lb/hour)	(tons/year)
NO_X	370.0	648.2
SO_2	2.2	3.8
CO	555.0	972.4
PM_{10}	29.6	51.9
$PM_{2.5}$	29.6	51.9
CO_2e	436,189.0	764,203.1
VOC	20.0	35.0
Lead	0.0018	0.003

Naughton Unit 3 Conversion to Natural Gas Firing
PSD Applicability Determination

Pollutant	Baseline Emissions (tons/year)	Future Potential Emissions (tons/year)	Emissions Increase or Decrease (tons/year)	PSD Signifiance Level (tons/year)	Is PSD Triggered?
NO_X	5,945.9	648.2	-5,297.7	40	No
SO_2	5,195.5	3.8	-5,191.7	40	No
CO	875.8	972.4	96.6	100	No
PM_{10}	1,446.4	51.9	-1,394.6	15	No
$PM_{2.5}$	626.1	51.9	-574.2	10	No
CO_2e	2,826,967.8	764,203.1	-2,062,764.6	75,000	No
VOC	40.1	35.0	-5.1	40	No
Lead	0.172	0.0	-0.2	0.6	No

Future potential emissions are based on a maximum annual average capacity factor of 40% following the conversion of Unit 3 to natural gas .

Appendix B

CH2M HILL Naughton Unit 3 Firing Natural Gas CALPUFF Modeling

Naughton Unit 3 Firing Natural Gas CALPUFF Modeling

Introduction

On May 28, 2009, Wyoming Department of Environmental Quality Air Quality Division issued the BART Application Analysis for PacifiCorp Naughton Power Plant. The analysis determined control strategies for improving visibility impairments. PacifiCorp has requested additional CALPUFF modeling be conducted for Naughton Unit 3 using Wyoming Department of Environmental Quality and EPA modeling procedures with updated emissions based on natural gas firing. The results from this analysis would then be compared to the previous BART CALPUFF modeling analyses of each control technology option for maximum delta-deciview, 98th percentile delta-deciview, and days above 0.5 delta-deciview at the Class I areas of concern.

This modeling memorandum presents the dispersion modeling methods and results from estimating the degree of visibility improvement from each control technology option for Naughton Unit 3 located in southwestern Wyoming, as well as natural gas firing.

Model Selection

The BART modeling assessment used the CALPUFF modeling system (version 5.7) to assess the visibility impacts at Class I areas. CALPUFF is a multi-layer, multi-species, non-steady-state puff dispersion model that simulates the effects of time- and space-varying meteorological conditions on pollution transport, transformation, and removal. BART guidance says, "CALPUFF is the best regulatory modeling application currently available for predicting a single source's contribution to visibility impairment and is currently the only EPA-approved model for use in estimating single source pollutant concentrations resulting from the long range transport of pollutants."

The CALPUFF modeling system also includes the CALMET meteorological data preprocessing program and the CALPOST post processor capable of refining concentration estimates, visibility impacts, and deposition.

Table 1 below summarizes the model versions and post-processing routines utilized to conduct BART CALPUFF assessment.

TABLE 1
EPA BART CALPUFF Modeling System Versions

CALPUFF Module	Utilized Version
CALMET	5.53a Level 040716
CALPUFF	5.711a Level 04716
POSTUTIL	N/A

CALPOST	5.51 Level 030709
Notes	Used constant 2.0 ppb ammonia

This assessment of Naughton Unit 3 used the identical meteorological data, CALPUFF model versions, and post-processing routines utilized by EPA. EPA Region 8 supplied the modeling files for Naughton Unit 3 for the coal control options analyzed, and these were used as the template for this analysis.

CALPUFF Methodology

Modeling Process

The modeling of Naughton Unit 3 with CALPUFF followed this sequence:

- Model Naughton Unit 3 firing natural gas and determine impacts at the nearby Class I areas
- Determine the most impacted Class I area
- Compare to the EPA modeled results

CALPUFF Modeling

The MESOPUFF II chemical transformation scheme was used by EPA in the CALPUFF model. It is used within CALPUFF to calculate transformation pathways for five active pollutants (SO_2, sulfates, NO_x, nitric acid, and nitrates). The oxidation of NO_x is dependent on photochemical reactions with reactive organic gases (ROG) and ozone. NO_x can be oxidized to nitric acid, which in turn can be converted to aqueous ammonium nitrate through an equilibrium reaction with HNO_3. Because of the preferential scavenging of ammonia by sulfate, the available ammonia is computed as the total ammonia minus available sulfate. Therefore the ambient background concentration of ammonia is critical to the ambient concentrations of ammonium nitrate, which is an important particulate compound contributing to the estimated visibility impacts.

Ambient Ammonia Concentrations

There are limited real time or historical ambient concentration measurements of ammonia within the southwest Wyoming modeling domain and therefore it is doubtful that the assumed 2 parts per billion (ppb) background ammonia concentration that EPA utilized in its analysis would be representative of the entire CALPUFF modeling domain throughout the year. However, the 2ppb value was used for this Naughton Unit 3 modeling. It should be noted that due to colder temperatures in the spring, fall, and winter, and a lack of agricultural activity in proximity to many of the Class I areas, the amount of ammonia available to convert NO_x and SO_2 to ammonium nitrate and sulfate respectively is likely more limited than 2 ppb.

Ambient Ozone Concentrations

The transformation rates of gaseous SO_2 and NO_x are dependent on the ambient concentrations of ozone. Temporally varying ozone values from a number of monitoring stations within the domain can be used within the model to estimate the transformation rates of SO_2 and NO_x.

Ozone data used by EPA for the analysis were considered representative of the CALPUFF domain and were utilized for the CALPUFF modeling of Naughton Unit 3.

Naughton Stack Parameters and Emissions

The Naughton Unit 3 stack parameters firing natural gas were supplied by PacifiCorp staff. The stack parameters are summarized in Attachment A.

For Naughton Unit 3, the emissions were speciated into the constituents described below:

- Sulfur dioxide (SO_2)
- Oxides of nitrogen (NO_x)
- Fine particulate (diameter less than or equal to $PM_{2.5}$)
- Coarse particulate (diameter between $PM_{2.5}$ and PM_{10})
- Sulfate (SO_4)
- Nitrate (NO_3)
- Nitric Acid (HNO_3)

Emissions supplied for the natural gas firing of Naughton Unit 3 were for particulate matter, nitrogen oxides, and sulfur dioxide. Since the new scenario uses natural gas as the primary fuel, it is conservatively assumed all PM from the unit would be $PM_{2.5}$.

Class I Areas and Receptor Grids

Class I areas evaluated for modeling the proposed natural gas firing of Naughton Unit 3 were identical to the EPA Region 8 modeling analysis. The following lists the Class I areas that were modeled for this analysis:

Class I Area

- Bridger Wilderness
- Fitzpatrick Wilderness
- Grand Teton NP
- Teton Wilderness
- Yellowstone NP
- Washakie Wilderness
- North Absaroka Wilderness

Visibility Post-processing

CALPOST

The CALPOST module was used to determine 24-hour average visibility results. Output is specified in deciview (dV) units. The FLMs' recommended procedure for determining Class I visibility impacts require the use of Method 8, however, the EPA assessment used Method 6. Therefore Method 6 was used in this analysis.

Calculations of light extinction were made for each pollutant modeled. The sum of all extinction values was used to calculate the delta-dV (ΔdV) change relative to annual average natural background. The following default light extinction coefficients for each species were used:

- Ammonium sulfate 3.0
- Ammonium nitrate 3.0
- PM coarse (PM_{10}) 0.6
- PM fine ($PM_{2.5}$) 1.0
- Organic carbon 4.0
- Elemental carbon 10.0

CALPOST Visibility Method 6 (MVISBK=6) was used for the determination of visibility impacts. Identical inputs from the EPA Region 8 modeling files were used for this assessment.

Results

Modeling Results

Table 2 below summarizes the CALPUFF modeling analysis results for Naughton Unit 3 firing natural gas at the Jim Bridger Wilderness Area. Jim Bridger Wilderness Area was the Class I area with the greatest impact from Naughton Unit 3. A complete summary of all modeling results for each Class I area are summarized in Attachment B.

The results are daily delta deciview averages and the highest daily, eighth highest daily and average of eighth highest daily at one receptor within the Class I area for a given year or range of years. Also, the days above 0.5 delta-deciview are presented.

TABLE 2
Naughton Unit 3 Natural Gas: Bridger Wilderness Impact Results

Impact	2001	2002	2003	Average
Maximum delta-DV	0.948	0.831	0.732	0.837
98^{th} percentile delta-DV	0.275	0.241	0.345	0.287
Number of Days >0.5 delta-DV	3	3	1	3[a]

[a] Maximum of the three years

Table 3 below summarizes the impacts from each of the three control options evaluated by EPA Region 8 at Bridger Wilderness Area to Naughton Unit 3 fueled on natural gas. Overall, the analysis demonstrates that the unit fueled on natural gas shows visibility impacts below the 0.5 delta-dV BART applicability threshold and impacts below the most stringent control technology modeled by EPA Region 8. Table 4 summarizes the same parameters but for the Fitzpatrick Wilderness Area.

TABLE 3				
Comparison to EPA results				
Bridger Wilderness Area				
98th Percentile Impact (dV)				
Model	**2001**	**2002**	**2003**	**AVG**
EPA 3 Control Option (Scenario B: PacifiCorp committed controls and selective catalytic reduction (SCR) at permitted rates)	0.710	0.650	0.830	0.730
New Gas Conversion	0.275	0.241	0.345	0.287
Number of Days >0.5 Delta dV				
Model	**2001**	**2002**	**2003**	**Max**
EPA 3 Control Option (Scenario B: PacifiCorp committed controls and selective catalytic reduction (SCR) at permitted rates)	17	10	14	17
New Gas Conversion	3	3	1	3

TABLE 4				
Comparison to EPA results				
Fitzpatrick Wilderness Area				
98th Percentile Impact (dV)				
Model	**2001**	**2002**	**2003**	**AVG**
EPA 3 Control Option (Scenario B: PacifiCorp committed controls and selective catalytic reduction (SCR) at permitted rates)	0.372	0.287	0.259	0.306
New Gas Conversion	0.154	0.114	0.134	0.134
Number of Days >0.5 Delta dV				
Model	**2001**	**2002**	**2003**	**Max**
EPA 3 Control Option (Scenario B: PacifiCorp committed controls and selective catalytic reduction (SCR) at permitted rates)	4	3	1	4
New Gas Conversion	0	1	0	1

References

- Federal Land Managers' Air Quality Related Values Work Group, Phase I – Revised (2010), Natural Resources Report, NPS/ NRPC/ NRR – 2010/ 232, October 2010.
    - National Park Service/ Federal Land Managers Particulate Matter Speciation Workbook, accessed December 11, 2012: http:/ / www2.nature.nps.gov/ air/ perm its/ ect/ ectCoalFiredBoiler.cfm?CFID=9494566&CFTOKEN=90762878
- Colorado Department of Public Health (1996). *Mt. Zirkel Wilderness Area. Reasonable Attribution Study of Visibility Impairment*. Final Report. July 1996

Attachment A

Stack Parameters

Model Input Data	Gas Conversion
Heat Input (MMBtu/hr)	3,700
SO_2 Stack Emissions (lb/MMBTU)	0.0006
SO_2 Stack Emissions (lb/hr)	2
NO_x Stack Emissions (lb/MMBTU)	0.1
NO_x Stack Emissions (lb/hr)	370
PM_{10} Stack Emissions (lb/MMBTU)	0.01
PM_{10} Stack Emissions (lb/hr)	37
PM_{10}-$PM_{2.5}$ Stack Emissions (lb/hr)	0
$PM_{2.5}$-PM_{10} Stack Emissions (lb/hr)	37
Total Sulfate (as SO_4) (lb/hr)	neg
Stack Conditions	
Stack Height (feet)	475
Stack Height (meters)	145
Stack Exit Diameter (feet)	26.5
Stack Exit Diameter (meters)	8.08
Stack Exit Temperature (degF)	315
Stack Exit Flow (lb/hr)	3,591,887
Stack Exit Area (square feet)	552
Stack Exit Velocity (feet per second)	43.51
Site Elevation feet above mean sea level	6939
Latitude deg: min : sec	41:45:31.91
Longitude deg: min : sec	110:35:49.47
Type of Boiler	Tangentially-fired
Boiler Fuel	Gas

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Attachment B

Naughton Unit 3 Natural Gas Firing CALPUFF Modeled Results

Naughton Unit 3

Impacts expressed as delta-deciviews

Days expressed as whole days

Scenario: Gas Conversion Emissions

	Bridger Wilderness				Fitzpatrick Wilderness				Grand Teton NP				North Absaroka Wilderness			
	2001	2002	2003	Max	2001	2002	2003	Max	2001	2002	2003	Max	2001	2002	2003	Max
Highest Impact (dV)	0.948	0.831	0.732	0.948	0.441	0.673	0.271	0.673	0.286	0.34	0.233	0.34	0.163	0.307	0.097	0.307
98th Percentile Impact (dV)	0.275	0.241	0.345	0.345	0.154	0.114	0.134	0.154	0.131	0.188	0.103	0.188	0.073	0.065	0.038	0.073
Number of Days >0.5delta DV	3	3	1	3	0	1	0	1	0	0	0	0	0	0	0	0

	Teton Wilderness				Washakie Wilderness				Yellowstone NP			
	2001	2002	2003	Max	2001	2002	2003	Max	2001	2002	2003	Max
Highest Impact (dV)	0.235	0.292	0.193	0.292	0.175	0.25	0.228	0.25	0.186	0.302	0.189	0.302
98th Percentile Impact (dV)	0.106	0.148	0.092	0.148	0.118	0.113	0.08	0.118	0.119	0.122	0.063	0.122
Number of Days >0.5delta DV	0	0	0	0	0	0	0	0	0	0	0	0